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Section 1
Introduction and Summary

The development of a regional wastewater management plan has been in progress for many years. The basic procedure for development, approval and implementation of such a plan is that the King County Executive studies and proposes a plan and the King County Council deliberates, modifies and adopts the plan.

The Executive has proposed a Regional Wastewater Services Plan (RWSP), termed "The Executive's Preferred Plan." The Regional Water Quality Committee (RWQC) considered the Executive's Preferred Plan and other service strategy options to meet the wastewater management objectives over a period of eight months. The RWQC then forwarded a recommendation to the King County Council in December 1998. The plan recommended by the RWQC is essentially the same as the Executive's Preferred Plan, with modifications to financial and implementation policies.

King County Council is currently deliberating the RWSP received from the RWQC. The Council decided to have the plan reviewed by a Panel of experts, and drafted a series of questions for the Panel to consider. The questions are presented at the end of this section.

The King County RWSP Peer Review Panel convened in the King County Courthouse on April 14, 15 and 16, 1999, to review the Council's eleven questions. The agenda identified about 33 hours of working time, not including after hours during which Panelists continued their discussions informally. Within that brief period of time, the Panel reviewed information, heard presentations by persons responsible for studying and evaluating the various elements of the plan, and deliberated the King County wastewater situation in comparison with their own experience at other locations and in comparison with standards of the industry.

Montgomery Watson facilitated the Peer Review and has summarized the Panel's findings and deliberations in this report.

SUMMARY OF THE REVISED SERVICE STRATEGIES

The service strategies originally presented in the *Regional Wastewater Services Plan Draft Plan (May 1997)* were revised based on updated population projections in 1998. The revised strategies are described below and include the following elements common to each strategy: produce Class B biosolids at all three plants; control combined sewer overflow events to one event per year per outfall by 2030; control inflow and infiltration in the local collection systems; and investigate, produce, and distribute reclaimed water.

Service Strategy 1 (Expand East & West Plants)

Service Strategy 1 would maintain the existing two-plant system. Under this strategy, King County would expand the West Treatment Plant to 159 mgd by the year 2029. The East Treatment Plant would be expanded to 135 mgd by 2013 and to 154 mgd by 2021. The County

would also parallel the Kenmore Interceptor. The total net present value cost of Service Strategy 1 is about $789 million.

Service Strategy 2 (Add North Plant - Expand East & West Plants)

Service Strategy 2 proposes a three-plant system. The West Treatment Plant would be expanded to 159 mgd by 2013 and the East Plant would be expanded to 127 mgd by 2029. A third 27 mgd treatment plant would be constructed by 2024 to accommodate additional wastewater flows from the northern service area. King County would also parallel the Kenmore Interceptor under this strategy. The total net present value cost of Service Strategy 2 is about $1.027 billion.

Service Strategy 3 (Add North Plant - Expand East Plant)

Strategy 3 also proposes a three-plant system. Under this alternative, the West Treatment Plant would not be expanded, and the East Treatment Plant would be expanded to 135 mgd by 2020. The North Treatment Plant would undergo a phased expansion from 18 mgd by 2010, 36 mgd by 2030, and 54 mgd by 2040. This strategy also requires building a conveyance system to carry influent to the North Treatment Plant and an outfall to Puget Sound by the year 2010. The total net present value cost of Service Strategy 3 is about $1.086 billion.

Service Strategy 3B (Expand East Plant - Add North Plant)

Strategy 3B is a modified version of Strategy 3 developed at the request of the RWQC in 1998. This strategy delays the need for a third treatment plant by first expanding the East Treatment Plant to 135 mgd and paralleling the Kenmore Interceptor by 2010. The East Plant is expanded again in 2020 to 154 mgd, and in 2030, an 18 mgd North Treatment Plant is added along with a forcemain from Kenmore to the North Plant. In 2040, the North Treatment Plant would be expanded to 36 mgd. The total net present value cost of Service Strategy 3B is about $964 million.

Service Strategy 4 (Expand East & West Plants - Add a Tunnel)

This strategy proposes a two-plant system as in Strategy 1, with the West Treatment Plant reaching a planned capacity of 159 mgd by 2013. The East Treatment Plant would be expanded to 135 mgd by 2024 and 154 mgd by 2037. This strategy also includes the phased construction of an 18-mile long deep tunnel and force main by 2025. This tunnel would be used for conveying and storing wastewater flows. The total net present value cost of Service Strategy 4 is about $1.217 billion.

SUMMARY OF KEY FINDINGS

The Panel found that many elements of wastewater management are common to all of the Service Strategy alternatives. Service Strategies differ in terms of location of major physical facilities, timing of the implementation of those facilities, cost, flexibility and risk, as summarized below. The findings of the Panel are based on, and therefore limited by, information presented by the County and its consultant team over the three-day period.

Location and Timing of Facilities

The Panel found that, although a specific site for a new North Plant has not been selected, many of the unknown factors associated with the plant, such as lengths and costs of conveyance pipeline to the plant and from the plant to a discharge location have been fairly estimated for a programmatic level planning activity. The Panel concluded that Service Strategy 1 will probably also include a third plant, but that it would not be constructed until after the planning period included in the RWSP. This need for a third plant would result because demand for wastewater service associated with population is not estimated to reach "build-out" or saturation at the end of the planning period. Risks associated with the need to build a parallel eastside interceptor and expand the East Plant to its ultimate secondary treatment capacity might lead to a third plant sooner even under Service Strategy 1, particularly if population growth is underestimated.

Costs of Facilities and Operations

The Panel agreed that the estimated costs of identified facilities were reasonable. Costs of some of the relatively smaller elements of the service strategies, such as the water reuse and I/I programs, were not yet identified, diminishing confidence associated with the estimates of those elements. Costs have been compared two ways, by summing total capital costs at today's dollar value, and by computation of the present worth of future capital and annual costs. The resulting cost comparisons between service strategies are as follows:

Service Strategy	Cumulative Capital	Present Value
1	1,162	789
2	1,620	1,027
3	1,544	1,086
3B	1,584	964
4	1,849	1,218

Costs in millions of 1998 dollars.

Financing

The Panel found that the County's methods of charging customers using base sewer rates and capacity charges are commonly used methods by wastewater utilities and are appropriate. The Panel found that the County has the capacity to finance the projected capital improvement plan under any of the service strategies and that the financial planning assumption of annually issuing revenue bonds is conservative and appropriate. The Panel found that the County's planning criteria for minimum net revenue coverage and minimum unencumbered fund balances may not be sufficiently conservative for the purpose of maintaining high bond ratings. Even though the rating agencies have relied upon these criteria in the past, higher criteria may be more compatible with high ratings for financing the projected capital improvement program. The effect of higher criteria would be increased sewer rates and capacity charges, but the amount of increase would be minimal and would not change the relative attractiveness of the service strategies. The Panelists found that it is conservative to assume for planning purposes that the Legislature will

not change the capacity charge statute for several years. The implications of no change in statute are that the County would not meet its stated goal of growth-pay-for-growth as well as it would with change in statute, and that projected sewer rates would increase by as much as five percent to offset reduced revenue from capacity charges.

Flexibility of Service Strategies

The Panel concluded that Service Strategy 3 has greater flexibility to meet future regulations such as Total Maximum Daily Load (TMDL) limits for nitrogen limitation and other water quality factors, future requirements resulting from the Endangered Species Act (ESA) listing of Puget Sound Chinook, future water reclamation and reuse opportunities, and future demand if population growth exceeds projections or is focused more in the northern part of the service area than expected.

Risk of Service Strategies

The Panel determined that Service Strategy 1 has somewhat greater risk of implementation delay or denial due to obtaining permits and permission associated with objection from residents, businesses and governments serving Renton and Magnolia. Service Strategy 3 also has risk involved with permitting and mitigation associated with the proposed North Plant.

OTHER FINDINGS OF THE PANEL

The Peer Review Panel addressed the eleven questions in the following general order:

1. Population and Regulations
2. Conveyance
3. Treatment
4. Costs and Finance
5. Risks of Implementation

The Panel considered each of these topic areas in a number of separate but related sessions. Following are brief summaries of the findings of the Panel supplementing the key findings presented above.

Population. The Panel found that population estimates overall are appropriately predicted, although some sub-areas will grow at faster or slower rates of change than the planning area as a whole. The Panel expressed concern that the plan does not contemplate any widening of the Urban Growth Area over the next 30 plus years. Population and its demand for wastewater service could be notably larger with a change in the Urban Growth Boundary.

Regulations. The Panel recognized that regulations change and that the plan takes this dynamic into account. Options with more physical and operational flexibility will better accommodate changed regulatory conditions.

CSOs may be subject to more stringent regulation in the future, particularly in consideration of the ESA listing of Puget Sound Chinook and the potential for development of TMDLs in the

receiving water. CSOs discharging to bathing beaches may be subject to more stringent regulation than one untreated event per year.

Land-use regulatory issues appear to affect future expansion at the West Treatment Plant more than water quality considerations. Service Strategy 1 relies on the ability to permit expansion of the West Plant and the East Plant in a timely manner. Service Strategies 3 and 3B rely on the ability to site and construct a third treatment plant. Siting and construction of a third treatment plant would allow added flexibility in responding to uncertainties in the regulatory environment.

No guidelines exist by which to determine whether coastal marine ecosystems are eutrophic. Local research efforts should continue to determine whether Puget Sound and its tributary waterways are adversely impacted by excessive nutrients. Sources of nutrients need to be determined if cost-effective control efforts are required.

It would be wise to develop and use a water quality model for the Sound and its tributaries in making major decisions regarding the diversion of wastewater from selected locations. Monitoring data can also be used to show long-term trends and provide more quantitative information for decision-makers. Continued monitoring can provide feedback on the success of various strategies and long-term trends that may be unrelated or independent of wastewater management activities or treatment strategies.

Technologies and Design Criteria. The Panel determined that the technologies and design criteria assumed in the planning activity are reasonable and appropriate for this stage of planning. The technologies and design criteria will be reviewed at the predesign stage of each major project.

Infiltration/Inflow. The Panel concluded that the planned concept of quantifying and defining the extent of the Infiltration/Inflow (I/I) problem is an appropriate first step. Some of the Panelists felt that the program could be accelerated. Panelists also expressed concern that the capacity charge should not be a mechanism that allocates I/I problems associated with existing facilities and customers to future customers.

Combined Sewer Overflows. The Panel found that the RWSP includes a program to improve Combined Sewer Overflows (CSOs) in common for all the service strategies. Panelists concluded that it is unlikely that the State of Washington regulatory standard of one untreated discharge per year will be lessened to the federal policy standard. Panelists pointed out that federal regulation suggests that untreated CSOs in endangered species habitats or bathing beaches should be eliminated or relocated.

Secondary Treatment. The Panel found it unlikely that the federal regulation for secondary treatment would be relaxed or that a waiver from the regulation could be achieved for any of the existing or future treatment plants.

Biosolids. The Panel confirmed that the County's existing planned biosolids programs are both outstanding. No changes were recommended by the Panel.

Water Reuse. The Panel inferred that a strong commitment to water reuse under any of the service strategies tends to indicate that a more accelerated program would be appropriate. The Panel found that the estimated cost of the reuse program, at $1 million per year, has the weakest justification of all the programmatic cost estimates, but recognized that a more specific reuse program definition will emerge following selection of a service strategy. The Panel noted the importance of working with local water purveyors to ensure that coordinated marketing, product availability, and financial aspects are mutually recognized and optimally pursued.

Endangered Species Act. The Panel noted that all of the service strategies will incorporate impacts of the recent Endangered Species Act (ESA) designation for Chinook salmon; however, specific ramifications of the ESA, such as more treatment (e.g., for nitrogen) or more/sooner CSO control, would apply differently to different service strategies. The service strategies have different degrees of flexibility depending on how the response to endangered species listings develops. For example, if pollutant loadings must be reduced or a higher level of treatment is necessary for water reuse or nutrient removal, there needs to be room to expand the existing plants. Service Strategy 3 provides more flexibility in this regard.

Water Quality. The Panel found that nutrient loading concerns (primarily nitrogen) in South Puget Sound make planning for nitrogen removal facilities prudent. Service Strategy 3 is more flexible in this regard since there would be more room for planning the inclusion of nitrogen removal facilities at a new plant without sacrificing space for water reuse/reclamation facilities. Service strategies that rely on existing plants with limited expandable space are less flexible. The Panel found that the possibility for future nitrogen removal should be considered in the long-range planning, but the need is unknown at this time.

Cost Estimates and Comparisons. The Panel determined that the cost estimates and comparisons assumed in the planning activity are reasonable and appropriate.

Questions for the Peer Review Panel

1. (a) Are the population projection and economic activity assumptions reasonable? (b) Are the system capacity assumptions reasonable? (c) How flexible and economical are the individual strategies if the wastewater service demand projections are too high or too low?

2. Are the strategies based on sound wastewater treatment and conveyance technologies and on sound engineering assumptions? Was there adequate review of established and applied technologies? Can the strategies be implemented in the time frames identified? Are the estimated costs reasonable? How well does each strategy maximize existing investment? How well does each strategy reduce wastewater flows and solids through cost-effective demand management programs and conservation?

3. Are the assumptions for program and costs reasonable for the following: inflow/infiltration, combined sewer overflow, biosolids, water reuse?

4. Are the methods that were used to compare costs among the strategies appropriate? Are there other analytical approaches that should be considered in addition to "net present value" and "cumulative capital costs"?

5. Are the financial assumptions reasonable? Will they allow the system to recover costs? Do they reflect professional utility financing principles? Are two rates, "base rate" and "capacity charge", appropriate financing methods? Are there other options to allocate new capacity costs to new growth?

6. Are assumptions about the regulatory environment reasonable? How well do the strategies respond to uncertainties in the regulatory environment?

7. Are the strategies flexible and adaptable to (a) endangered species listings such as Chinook salmon; (b) the need for additional water supply, (c) need for in-stream flows and water for fish, and (d) different development patterns?

8. How well does each alternative address the existing conveyance capacity problems (such as the Eastside and Kenmore interceptors)? Does each alternative have sufficient conveyance to support planned additional system capacity?

9. Scientists differ on whether the benefits of secondary treatment are equal to or exceed its costs. Is it reasonable to expect that this requirement will be changed?

10. How well does each strategy provide certainty for achieving needed system capacity in a timely fashion and reduce risk for obtaining such capacity, while still retaining flexibility for implementation?

11. The above nine questions cover the topics of population and capacity projections, economic and financial analysis, regulations and water quality, technologies and costs of, inflow/infiltration, combined sewer overflows, biosolids, water reuse, and treatment and conveyance. Are there other significant topics that were not reasonably evaluated for all five strategies?

Section 2
Questions and Responses

Question 1a. Population and Economic Activity

Are the population projection and economic activity assumptions reasonable?

DISCUSSION

King County has relied on Puget Sound Regional Council (PSRC) planning data as a basis for projecting population and economic conditions through the year 2020. Sensitivity analyses were performed by King County and the analyses were shown to be consistent with PSRC forecasts. Increasing population densities (persons per acre) are projected. The high rate and amount of growth in the northeast part of the service area provides a rationale for the Service Strategies which include the North Treatment Plant. Growth in the east and south parts of the service area will require expansion of the East Treatment Plant.

ISSUES

- **Unsewered Population.** About eight percent of the population was unsewered in 1990. The planning activity assumes that the entire population will be sewered by 2020.

- **Growth Curve.** A growth projection was prepared by curve fitting, based on land availability. That exponential shaped curve was adjusted, beyond the year 2020, to a more linear growth projection.

- **Urban Growth.** Florida and Oregon have recently revised urban growth areas, and it is conceivable that in King County the Urban Growth Boundary will change before 2030. King County staff indicates that the wastewater plan incorporates the concurrency requirements of the Growth Management Act (GMA), but does not incorporate any change in the Urban Growth Boundary.

- **Employment Growth and Stability.** Employment growth and stability by sector, but not by company, has been incorporated into the Puget Sound Regional Council projections which were relied upon in development of the wastewater plan data.

- **Consequences of Not Providing Capacity.** If capacity were not provided to meet prospective demand for wastewater service, possible outcomes would include moratoria, lawsuits, and contract abrogation.

FINDINGS

- **Overview of Analysis and Assumptions.** The sources of information and the methods of analysis were well recognized and would be defended by most demographers. It was the opinion of the Panel that the overall service area population forecasts appear to be quite reasonable but that some sub-areas may be growing faster than others. The Panel also believes it to be prudent to consider that the Urban Growth Boundary will be moved to the east during the planning period, resulting in additional population to be served.

Question 1b. System Capacity Assumptions

Are the system capacity assumptions reasonable?

DISCUSSION

The design criteria used for developing the treatment plant capacities under all service strategies are based on the best available technology. Unit sizes are based on industry standards and meet effluent water quality goals. Staff also described how they have assumed no, or little I/I flow reduction until they have the results of the I/I study.

The need to provide nitrogen removal could be driven by development of TMDLs, particularly at the East Plant, due to South Puget Sound water quality problems. An evaluation of the need for ammonia removal may also be evaluated as part of the planning associated with the listing of Puget Sound Chinook salmon under the ESA. The evaluation of treatment and conveyance cannot be separated. Modification to the treatment strategy directly impacts the conveyance system and vice versa.

ISSUES

- **Nitrogen Removal.** If nitrogen removal were required, the assumptions about expansion capacity at both the West and East Plants would be limited by available space. Also, near term expansion at either or both plants could lead to space issues if nitrogen removal were later required. Alternative treatment options would be required, which would also impact the conveyance system. Nitrogen removal at the West and East Plants could limit or preclude incorporation of a reuse program due to space limitations.

- **Land Requirements and Acquisition.** The assumed 30- to 60-acre footprint of the North Plant could have inadequate buffer and may limit flexibility for expansion. Uncertainties of land banking were noted and discussed.

- **Coordinated Planning and Verification.** Flow projections based on population projections have been verified with land use forecasts made by Puget Sound Regional Council. Although flows in small sub-areas with known land uses have not been verified, verification has been done on a system-wide basis and sub-regionally (without land use differentiation) using 100 flow monitors and pump station records.

- **Per Capita Flows.** Per capita flows in the wastewater plan are assumed not to change in the future; however, they do reflect the effects of both aggressive and moderate conservation pursuant to data provided by Seattle Public Utilities.

- **Conveyance Facility 20-year Design Event.** It appears reasonable to target a 20-year design event for the control/containment of I/I flows in those areas with separated sewers. The data showed that flows from a 20-year event would be approximately 20 percent higher than flows from a 5-year event.

FINDINGS

- **Assumptions.** The system capacity assumptions appear to be reasonable except as noted below. The need to complete the I/I study to further substantiate peak wet weather flow rates and associated conveyance capacities is acknowledged by King County staff and is reiterated by the Panel. The Panel suggests that every effort be made to resurrect historical flow data to the two existing treatment plants to reconfirm the reasonableness of the flow projections.

- **Nitrogen Removal.** It appears the treatment strategies have not fully considered the potential impacts of future regulatory requirements for nitrogen removal on system capacity. The assumptions about expansion capacity at both the West and East Plants show that future uses would be limited by available space.

- **North Treatment Plant Land Requirements and Acquisition.** The land required for the North Plant may be understated. Acquiring a larger parcel would be more prudent. If land banking is considered, it should be coupled with an appropriate level of planning and environmental review to reduce uncertainty of future construction of the North Treatment Plant.

- **20-year Design Event.** The Panel found the basis for a 20-year design conveyance event to be reasonable. It would be helpful to compare this design standard with other metropolitan areas in the United States, or document the added environmental protection afforded by a 20-year design event versus a lower standard.

Question 1c. Flexibility of Individual Strategies to Change in Demand

How flexible and economical are the individual strategies if the wastewater service demand projections are too high or too low?

DISCUSSION

The Peer Review Panel discussed the flexibility of Service Strategies 1 and 3, focusing initially on how the strategies could accept high growth in service demand. It was noted that a key objective of the RWSP, or any other long-term plan, is to provide flexibility to accept changing conditions. King County must have the required wastewater facilities in-place when required both for concurrency and water quality considerations.

ISSUES

- **Service Strategy 1.** Under a low to moderate growth scenario, Service Strategy 1 would be adequate. Under a high growth scenario, it may not. The risk of Service Strategy 1 could be compounded by the difficulty of obtaining near-term feedback on accuracy of flow projections.

- **Service Strategy 3.** Under a low to moderate growth scenario, Service Strategy 3 would result in investments being made earlier than required. Overall, Service Strategy 3 affords greater flexibility to accept any change; however, there is a cost for this benefit.

- **Cost Difference.** The cost difference between Service Strategies 1 and 3 amounts to about $1 to $2/month per residence over the project life. The present worth difference between these strategies is approximately $300 million. The flexibility offered by Service Strategy 3 does not carry a large penalty to individual homeowners. There was some doubt that the projected rates will be met due to anticipated long-term needs for costly infrastructure maintenance. King County must continue legislative efforts as necessary to secure the proposed plan for increased capacity fees to help maintain the proposed rate structure.

FINDINGS

- If Service Strategy 3 is pursued and a West Treatment Plant expansion is not planned at this time, it would not preclude expanding the West Treatment Plant in the future.

- If Service Strategy 3 is pursued and the anticipated flows do not materialize as rapidly as anticipated, the cost penalty would not appear to have a large impact on rates.

Question 2a. Treatment and Conveyance Technologies/Assumptions

Are the strategies based on sound wastewater treatment and conveyance technologies and on sound engineering assumptions?

DISCUSSION

The range of technologies that were reviewed by King County staff in the preparation of the RWSP was significant and included both well proven technologies and emerging technologies that hold promise in the future. With regard to conveyance facilities, both tunnel and pipeline alternatives were assessed. These are the predominant types of technologies that are available for the length and capacities needed by King County.

FINDINGS

- **Basis of Strategies.** For the existing level of planning, the strategies are based on sound wastewater treatment technologies and sound engineering assumptions.

- **Review of established technologies.** In developing the RWSP, King County staff included the full range of technologies for conveyance, storage and treatment of wastewater that would be expected during the development of a comprehensive wastewater management plan.

Question 2b. Review of Technologies

Was there adequate review of established and applied technologies?

DISCUSSION

The range of liquid and biosolids treatment technologies considered by King County staff was wide. Their assessment of the usefulness of proven versus emerging technologies was appropriate and consistent with best practice. With regard to biosolids technologies, King County's biosolids program is a nationally recognized leader and used as a basis of comparison by other agencies.

FINDINGS

- **Review of technologies.** The staff appreciates the need to keep abreast of emerging technologies, yet understands the need to move forward on the basis of proven, credible technologies. The Panel fully agrees with staff that the predesign stage will offer a second opportunity to review and take advantage of new technologies that prove themselves in the meantime.

Question 2c. Schedule of Strategies

Can the strategies be implemented in the timeframes identified?

DISCUSSION

The planning horizon for the RWSP is very long, with the first major facilities not required until 2007 to 2010. Thus, even the first facilities have at least 8 to 11 years to implement. Staff outlined that the biggest impact on meeting the timeframes may be the permitting and approval stages of individual projects rather than the engineering or construction phases.

Both Strategies 1 and 3 will require aggressive schedules to provide conveyance and treatment capacities when needed. Short-term improvements to the conveyance system may provide some flexibility to extend the schedule dates, but only for a few years. A timely decision on the recommended strategy is required. Once that decision is made, adequate resources, both internal staff and outside consultants, must be allocated to complete the strategy within the proposed timelines. There is little float in the schedule under any strategy.

FINDINGS

- **Feasibility of Schedule.** All strategies have feasible, yet aggressive, schedules. Meeting the schedule will require timely decisions, proactive involvement, commitment of resources, and close control of the process. However, if Service Strategy 3 is to be implemented, the siting studies related to the North Treatment Plant, effluent pipeline and outfall must begin this year. Some Panelists suggested that receiving water quality analysis is necessary to assure where added treatment capacity can be sited and such analysis is on the critical path.

- **I/I Reduction Potential.** It may be difficult to account for I/I reduction potential in the conveyance facilities with the proposed schedules under any strategy. This is because the information to quantify I/I reduction would not be complete in time to incorporate results.

- **Sanitary Sewer Overflows.** If the schedule is not maintained, more sanitary sewer overflows may occur, particularly in the Kenmore area. Under Service Strategy 3, the Panelists noted that the Kenmore Interceptor project should be started if the North Plant site were not identified by 2001.

- **North Treatment Plant Schedule.** The first phase of Service Strategy 3 would take at least 7 to 10 years to implement. Some short-term improvements, such as storage and flow transfers in the Kenmore area, could extend the completion date for the North Plant by 3 to 6 years. The Panelists agreed that Service Strategy 3 must start soon and North Plant siting studies should be fast tracked. Studies that need fast tracking include lands inventory, flow monitoring, oceanography, geotechnical, and biological studies.

- **Litigation.** Potential litigation could dramatically impact the schedule of any of the service strategies.

Question 2d. Estimated Costs

Are the estimated costs reasonable?

DISCUSSION

Cost estimates are important to the development of a regional wastewater plan for several reasons. They are used to compare alternatives for the purpose of evaluating relative attractiveness. They are also used for advance financial planning purposes and to indicate financial impacts on the constituency. Evaluation of the cost estimating information and methodology was also useful regarding consistency of application regarding the alternative service strategies.

ISSUES

- **Contingencies**. Cost estimates of facilities for different functions were assigned different contingencies. Higher contingency factors were applied to projects of greater unknown nature (underground, mitigation, length, etc.).

- **Dollar Basis.** All costs were estimated in present day dollars. Future costs of projects to be constructed in the future were inflated at three percent per year.

- **Unit Costs of Treatment**. The unit cost of expanding existing treatment plants was estimated to cost about $4 million per million gallons per day (mgd) and the unit cost of constructing a new treatment plant was estimated to cost about $12 million per mgd. The principal factors related to the higher cost of the new plant were purchase of land, including buffer land, mitigation and additional, redundant process units that have to be included during initial construction. A contingency factor of 45 percent was applied. This relatively large contingency percentage is reflective of potentially high costs of mitigation that may be attached to a new plant.

- **Tentative Siting.** At a programmatic planning level, pipeline estimates reflect reasonable unit construction costs, but conservative estimates of lengths of conveyance pipe. This was exemplified in the estimated seven-mile length of conveyance pipe from the proposed North Treatment Plant to Puget Sound or Lake Washington. The actual length might be lower or higher.

- **Sources of Estimate Information.** Cost estimates were based on historical King County/Metro costs, including costs of both wastewater and transportation facilities. The estimates also reflect the experience of the consulting engineering firms that were engaged for planning and estimating the facilities and in-house operations and planning staffs.

FINDINGS

- **Cost Information and Analysis.** The Panel found the cost estimate information and analysis was generally reasonable and duplicable. The procedure involved a good mix of personnel and information sources.

- **Economic Rates.** The rates used for cost escalation, three percent, and the discount rate, six percent, were found to be reasonable. The six percent figure for the discount rate roughly reflects cost of capital. Under current economic and market conditions, both of these numbers are high, but they would be low for the early 1970s. For a 30-plus year plan they were found reasonable.

- **Presentation of Cost Comparisons.** Some Panelists thought other methods to display costs (stacked and side-by-side bar graphs) to more clearly indicate function (e.g., treatment or collection), object (e.g., Operations and Maintenance (O&M) or capital) and purpose (e.g., expansion or improvement/replacement) would be beneficial for certain audiences.

- **Cost Inclusion**. Panelists found that costs were fairly applied across alternatives. For example, all cost estimates included an allowance for sales tax and contingency.

- **Cost/Schedule Linkage.** The Panel found that cost estimates were reasonable only if the schedule estimates were reasonable. An accelerated schedule would result in increased cost.

Question 2e. Maximizing Existing Investment

How well does each strategy maximize existing investment?

FINDINGS

- **Use of existing facilities.** All strategies maximize the use of existing facilities to the extent that abandonment of major infrastructure is not planned.

- **Differences Among Strategies.** The differences in the strategies lie in when "spare" treatment or land/site capacities are used. Strategy 1 uses existing "spare" capacities now, or in the near term, whereas Strategy 3 retains existing "spare" capacity for later use to meet unforeseen needs. These needs could include the need to upgrade treatment levels at the East or West Plants due to regulatory requirements or the need to provide greater capacity to meet unforeseen population growth.

Question 2f. Demand Management and Conservation

How well does each strategy reduce wastewater flows and solids through cost-effective demand management programs and conservation?

FINDINGS

The Panel agrees with staff that the impact of demand management and conservation programs will have a minimal impact on the timing, sizing, and type of facilities improvements that would be recommended. These programs primarily deal with water consumption, rather than sewage flow/load generation, especially because I/I flow is such a major component and it is unknown when and how it can be reduced.

Question 3a. Inflow/Infiltration Program and Costs

Are the assumptions for program and costs reasonable for inflow/infiltration?

DISCUSSION

Ninety-five percent of the I/I problem originates in the component agency sewers rather than in the King County interceptors. The component agencies' systems exceed the design assumption of 1,100 gal/acre/day, and few of the agencies have done much to reduce their I/I flowrates.

The intent of the $31 million I/I program is to quantify, locate, and assess the most cost effective measures and reduction goals that should be pursued. The component agencies cannot begin major reduction projects until this study work is completed.

FINDINGS

- The I/I flows will drive the sizing of the conveyance facilities in separated sewer areas. Given the magnitude and lack of knowledge over what the cost-effective I/I reduction target should be, the need to conduct the $31 million I/I study program is urgent.

- It is commendable that at least a "placeholder" amount has been budgeted for the I/I study program. Although $31 million seems reasonable at the planning level, it is important that the scope and character of the I/I study program be fully developed and then costed. That is, do not tailor the I/I study program to the $31 million place holder value, but tailor the budget to the scope and character needed by the study.

- For the I/I study to be effective, cooperation with the component agencies will be of paramount importance. Given the difficulties inherent in coordinating with 32 component agencies, the amount of effort and commitment to be provided by King County will be large. However, given the impact of I/I flows on the sizing of conveyance facilities, this effort is warranted.

- The conveyance capacities should be re-evaluated based on the I/I study results.

- It appears reasonable to target a 20-year design event for the control/containment of I/I flows in those areas with separated sewers. The data showed that flows from a 20-year event would be approximately 20 percent higher than flows from a 5-year event.

- The Panel pointed out a potential inconsistency between the goals of the CSO program and the I/I overflow program. The CSO program will abate CSO overflows to once per year, whereas the I/I program will abate sewer system overflows to once per 20 years. Given that the west side of Lake Washington receives CSOs and the east side receives I/I overflows, the two sides of the lake will receive differing levels of protection. The major contaminant in both CSOs and I/I overflows will be fecal coliforms in an area of bathing recreation. The

Panel recommends that the implications of this inconsistency be more fully assessed and presented to decisions makers.

- The opportunity may exist for all service strategies to decrease the design storm return frequency, thereby reducing design flows and costs.

- There is a heavy reliance on the cost-effectiveness of the I/I program to establish the I/I reduction targets, but the environmental benefits of I/I reduction (less interception of groundwater flow, especially for streams which support threatened or endangered species) should also be identified and used to set these targets. These are site specific considerations.

- On a site-specific basis, depending on streams or discharge locations, I/I should be evaluated for pollutant loads to determine if it is more appropriate to capture this non-sanitary flow for treatment or to allow it to flow to receiving waters untreated.

- Some Panelists recommend a more aggressive approach to I/I reduction by accelerating the investment in the currently planned I/I evaluation program.

- Public awareness and education regarding the results of the I/I program is of key importance to implementing voluntary and potentially cost-effective reductions in I/I from private properties. It is recommended that once the data and evaluation of the results of the I/I assessment program are obtained, a survey of public opinion on the role of individual property owners in implementing potential solutions should be undertaken. This survey would assess the public attitudes toward voluntary versus mandatory versus willingness to pay issues for addressing the problem and what are the acceptable community options available to reduce the magnitude of the I/I problem.

Question 3b. CSO Program and Costs

Are the assumptions for program and costs reasonable for combined sewer overflow?

DISCUSSION

All service strategies include a 30-year program to abate 36 CSO locations. The Net Present Value (NPV) of this program would be $230 million. The performance goal for the CSOs is one overflow per year, which is more stringent than the federal goal of 4 to 6 events per year. The federal goal could be used as a fall back position should it prove too difficult to achieve the once per year goal at all locations.

FINDINGS

- The Panel advised that the federal goal for discharges to bathing waters or to endangered species habitats is elimination or relocation of the untreated discharge rather than 4 to 6 untreated CSOs per year. Therefore, King County will have to be cautious about relying on the state or federal goal, given that some of the CSOs discharge to bathing waters or to habitats of endangered salmon species.

- Given the 30-year duration of this element of the strategy, King County should gather, analyze and present environmental monitoring, economic, and other improvement data regarding the impacts of CSOs and the benefits of abating them. This data should be gathered before and after the CSOs are abated for the following reasons:

  - It will help set and substantiate priorities, which will be needed over the 30-year duration of the program.
  - It will help maintain support for the overflow abatement program during the course of the program.

- The cost of this long term monitoring will not be small and needs to be added and specifically identified in the program. The range of data to be gathered should be based on what is needed to substantiate the benefits of abating overflows rather than simply gathering the data required by state and federal agencies. For example, although the Environmental Protection Agency (EPA) may require monitoring of fecal coliforms, King County should continue to monitor viruses and *Giardia* in order to demonstrate that the improvements are implemented.

- The need for long term monitoring information also applies to sanitary sewer overflows.

- In seeking state approval for a 30-year CSO program, King County should seek inclusion of a compliance schedule in the relevant permits or enforcement order. This will provide some level of protection against third-party lawsuits.

- The costs appear very reasonable and appropriate for planning level purposes. The program as planned would deliver good value for the stated costs.

Question 3c. Biosolids Program and Costs

Are the assumptions for program and costs reasonable for the biosolids program?

DISCUSSION

The Panel made the observation that the existing biosolids program is highly successful and award winning, and asked the rhetorical question: Why change a good thing? The program assumptions were scrutinized and tested with respect to biosolids quality considerations; regulatory issues and potential regulatory changes; redundancy and flexibility of management strategies; and overall program costs. No significant issues were identified that would suggest a modification to the proposed biosolids program. The Panel felt that the assumptions upon which the biosolids components of the RWSP have been based appear reasonable. The consensus of the Panel is that the current biosolids program and its continuation as proposed under the RWSP is a sound plan.

FINDINGS

- The existing biosolids management program is highly successful and incorporates excellent diversity and redundancy in management alternatives.

- The program assumptions and costs appear reasonable and well-founded.

- The multiple reuse options (eastern Washington agriculture, forestland application, Class A product through private contractor) offer good and appropriate flexibility. The Panel believes King County should continue the study of technologies to produce Class A biosolids.

- It appears appropriate and advisable to continue the program as proposed under the RWSP.

Question 3d. Water Reuse Program and Costs

Are the assumptions for program and costs reasonable for water reuse?

DISCUSSION

King County has allocated a "placeholder" budget without defining the elements of a reuse program. The Panel cannot determine whether the assumptions for the program and the associated costs are reasonable without the details of the program. The Panel noted the importance of working with local water purveyors to ensure that coordinated marketing, product availability, and financial aspects are mutually recognized and optimally pursued.

ISSUES

- **Integration with Conveyance and Treatment.** Reuse planning needs to be closely integrated with conveyance and treatment. The location and size of a reuse facility will impact the assumptions used in the planning of treatment and conveyance facilities.

- **Pilot Studies.** Pilot studies may be required to determine the impact of introducing reclaimed water to streams on migrating salmonids. This is necessary to incorporate potential requirements of the Puget Sound Chinook ESA listing. TMDLs may also need to be considered in pilot studies. TMDLs may require a reduction in pollutant loadings and water reuse is a strategy to reduce loading if the water is reused for irrigation and not something that required a much higher level of treatment.

- **Costs.** The cost of producing reclaimed water will most likely exceed the market sale price. Satellite treatment plants will be expensive. Effective marketing and public information programs are critical to a successful reuse program.

FINDINGS

- Some Panelists felt a $20 million investment over 20 years should be expedited to determine the feasibility of reuse. The County might consider a water reuse opportunity bank as an alternative to annual expenditures.

- Some Panelists believe the investments in water reuse and other environmental management issues are prudent and will be favorably received by the community and reviewed by financing agencies.

Question 4. Economic Comparison of Alternatives

Are the methods that were used to compare costs among the strategies appropriate? Are there other analytical approaches that should be considered in addition to "net present value" and "cumulative capital costs"?

DISCUSSION

Cost is always a principal factor used to compare the relative attractiveness of alternatives. The plan compares the alternative service strategies in two ways: present value and cumulative capital. Present value is a method that incorporates both capital cost and annual O&M cost in the comparison. It also considers the time value of money, by discounting future expenditures to the present time. Cumulative capital merely adds up present day estimated costs of all construction and does not reflect either the time value of money or different requirements for O&M costs among alternatives.

FINDINGS

- **Methods Used.** The Panel found that present value and cumulative capital as methods to compute and display relative costs of alternatives appeared to be correctly calculated (without delving into detailed/large computer spreadsheets) and uniformly applied to the alternatives being considered.

- **Other Methods.** Panelists found that while the analytics of net present value may be correct, the meaning of the results is not always intuitively obvious to all audiences. The Panel suggested that displaying estimated annual costs, including estimated debt service associated with capital costs, throughout the planning period, would be useful. The annual costs and debt service amounts could be shown so as to indicate type of expenditure (CSO, I/I, treatment, etc.) and whether costs are associated with growth (expansion) or existing customers. The Panel suggested that showing these types of costs on a per million gallon basis would be useful, especially if done in a graphical format. The Panel suggested that an indication of future rates/charges estimated for given years (e.g., rates/charges in 2010, 2015, 2020, etc.), might better communicate the effects of the various service strategies to certain audiences.

- **Economic Rates.** The Panel found that the rates used for cost escalation at three percent and the discount rate at six percent were reasonable and conservative. The six percent figure roughly reflects cost of capital. Under current economic and market conditions both of these numbers are slightly high, but they would have been low in the early 1970s. For a 30-plus year plan they were considered reasonable.

- **Differences Among Alternatives.** The Panel found that costs of I/I, CSO, etc., were common to all the alternatives, and therefore suggested that the alternatives be compared considering only the matters of differentiation: conveyance and treatment. The Panel also

noted that the difference in estimated rate impact between Service Strategies 1 and 3 is about $2/month in the early years and $1/month in later years.

- **Cost of Mitigation.** Panelists recognize that there is a question as to whether the full cost of mitigation is included in the cost estimates. For example, site mitigation costs for the North Plant in Service Strategy 3 and for the West and East Plants in Service Strategy 1 may be low.

- **Cost of I/I.** The cost of I/I improvements is common to all the service strategy alternatives. Panelists noted that the actual I/I program, following pilot evaluations, etc., may represent a substantial cost, but that incurring that cost earlier may result in overall cost savings if the I/I work results in lower costs to provide conveyance capacity. The plan documents do not include an estimate of higher I/I program costs in the prospective rate/charge calculations for regional wastewater service. If the I/I correction costs are largely the responsibility of the component agencies, where an estimated 95 percent of the I/I is generated, this assumption will likely remain valid in future regional wastewater rate settings.

Question 5. Financing Methods and Assumptions; Rates and Charges

Are the financial assumptions reasonable? Will they allow the system to recover costs? Do they reflect professional utility financing principles? Are two rates, "base rate" and "capacity charge", appropriate financing methods? Are there other options to allocate new capacity costs to new growth?

DISCUSSION

Implementation of the RWSP will require money to replace and expand facilities and to operate and maintain the regional wastewater system. RWSP planning anticipates some grant money and internally generated funds, but relies on the issuance of revenue bonds as the primary source of capital for facility construction under all of the service strategies. Sewer rates are charged to the 32 cities and sewer districts based on the number of residential equivalents (not measured flow) served by each component agency. Capacity charges are charged to individual service locations directly by King County.

ISSUES

- **Financial Goals.** Financial goals and constraints incorporated in the current planning work include the following:

  - The County desires to be financially conservative and to maintain its current high credit ratings on bonds for wastewater service. The Panel was told that King County wastewater revenue bonds are rated AA/Aa, recently upgraded.
  - The County desires to have equity among existing customers and that financial responsibilities between current and future customers be fairly shared.
  - Regarding current and future customers, the County desires that "growth pay for growth." Under this goal, the County will provide regional facilities and services when needed (complying with the concurrency requirement of the Growth Management Act) and new regional wastewater accounts will be financially responsible for system expansions necessary to serve the new accounts.
  - Bond covenants require net revenue coverage of 1.15, but a County goal for facility planning purposes is to produce at least 1.25 net revenue coverage. The County goal has been relied upon by rating agencies.
  - A goal for minimum unencumbered fund balance is $5 million for facility planning purposes, which is about 2½ percent of the annual wastewater operating expenses in King County. Historical results of operations have yielded minimum balances of much higher figures; it has been as high as $90 million in recent years.

- **Sources of Capital.** Financial planning for all of the service strategies assumes that revenue bonds will be sold to develop most of the construction capital requirement. Grant funds will be sought, but the planning work has not relied on grants for much of the capital requirement. The current inventory of debt includes some obligations that are secured by the full faith and

credit of the County (termed "double-barreled" bonds). This method may be used in the future as well.

- **Capitalization.** The planned capitalization mix is approximately 80 percent from bond sales and 20 percent from internally generated funds, with net revenue coverage earnings as the source of capital paid from cash.

- **Scheduling and Structuring of Borrowings.** The financial planning projections indicate annual borrowings (bond sales). Panelists noted that this is a good assumption for programmatic planning activities, but that actual sales may be for multiple year capital requirements, reducing issuance costs. Market conditions or debt burden policies may favor greater cash (pay-as-you-go) financings for certain types of projects than is indicated in the 80-20 capitalization ratio indicated above.

- **Capacity Charges.** A single capacity charge (dollars per residential equivalency) will be charged to new connectors to the wastewater system, as is the current practice. Capacity charges are paid to King County over a fifteen year period or paid early as a discounted lump sum at the option of the individual owing the capacity charge.

- **Capacity Charge Enabling Legislation.** With the assumption of the Municipality of Metropolitan Seattle ("Metro"), the County "inherited" Metro's capacity charge legislation. The legislation includes a $10.50 per month cap on capacity charges and in 2001 reverts to one-half of the sewer charge and then may fund only projects listed in the 1989 comprehensive plan. Legislation has been proposed in the State Legislature to increase and restructure the restrictions so that capacity charges may be administered in accordance with local financial policy. The proposed legislation probably will not pass in the current legislature, but may pass in the future. The financing plan data provided to the Panel indicates projected scenarios assuming the proposed legislation is enacted and also assuming it is not enacted.

- **Capacity Charge Amounts.** The amount of capacity charges was projected as shown in the table below. In the second column of data are the average monthly capacity charges, assuming three percent cost escalation from the present to 2030. In the third column are the projected average monthly base sewer rates over the same period. In the fourth column are the projected average amounts that the sewer rates would be increased if there were no capacity charges and sewer rate revenue funded all costs including debt service of expansion projects.

Service Strategy	Capacity Charge	Sewer Rate	Rate Increase w/o Cap.Chg.
1	$ 9.11	$ 29.72	$ 1.11
2	19.71	29.74	2.04
3	26.72	30.02	2.66
3B	13.24	29.69	1.47
4	38.17	29.67	5.67

- **Capacity Charge Revenue and Population Growth.** If the population growth assumed in the financial plan does not occur, the planned additional revenue from capacity charges will not occur. To estimate possible financial outcomes, the financial plan was developed under different population growth scenarios (high, medium and low). If capacity charge revenue is inadequate, wastewater rates would have to be adjusted upward accordingly to meet financial commitments.

FINDINGS

- **Rates and Charges.** The Panel found that the base sewer rate method used by King County is commonly used in the wastewater utility industry. Some regional wholesalers use master meters instead of residential equivalents to determine wholesale amounts charged. The capacity charge method used by King County is unusual. Normally, capacity charges are collected in full before a building permit is issued. The amount of the capacity charge is usually based on the cost of purchasing future capacity and/or the value to "buy-in" to the existing system. Panelists acknowledge that total sewer charges will vary in different areas because the total sewer charge includes the King County regional sewer charge plus the charge of the local sewer service provider (the component agency). Panelists acknowledge that the non-inflated rate projections will not likely decrease as had been indicated to the Panel because other costs will arise that are not known at this time.

- **Financial Capacity.** The Panel found that, fundamentally, the County appears to have the financial capacity to finance any of the service strategies, however the Panel found that certain of the financial planning assumptions, as presented, conflict with one another and should be re-evaluated or otherwise resolved.

- **Bonds.** For programmatic level financial planning, bonds secured only by the revenues of the enterprise, issued annually, is considered appropriate. State Revolving Fund loans and variable rate obligations are methods of raising capital that were not directly addressed in the planning documents and the Panel felt these should be addressed when specific financings are planned. Further, the Panel found that general obligation bonds have been used in the past to produce capital at lower cost, and this method should also be considered for continued use in the future.

- **Credit Rating Considerations.** The Panel found that the $5 million departmental planning minimum unencumbered fund balance criterion may be incompatible with the goal of maintaining the current high credit ratings. The Panel wondered if $50 million would be a better goal in comparison with recent balances of about $90 million. A highly rated utility would normally have a minimum unrestricted funds balance of about ten to twelve percent (45 days of a year is a common criterion) of its annual expense budget.

  The Panel found that the minimum net revenue coverage goal of 1.25 may be too low, and suggested that a minimum net revenue coverage goal of about 1.40 would be more appropriate for maintaining the County's high credit ratings. Information provided to the Panel by the County Budget Office and Finance Department indicates that historically the

wastewater system has produced coverage considerably higher than goal and that the Finance Department considers 1.25 "sufficient to sustain the existing strong bond rating" and appropriate for planning purposes.

- **Capacity Charges**. Panelists acknowledged that projected capacity charges are almost three times higher with Service Strategy 3 than with Service Strategy 1 and about twice as much as with Service Strategy 3B, as indicated in the above table. The Panel acknowledged that payment over a fifteen year period of time as allowed by King County is not common in the industry, so this feature eases the financial burden of new connectors. The Panel did not evaluate ability to pay, but mentioned that the acceptable upper limit for capacity type charges is a political decision.

  Service Strategy 3 has a higher projected average capacity charge than Service Strategy 1 or 3B, and thus Service Strategy 3 has greater risk associated with the financial aspects of its implementation.

  Panelists suggested that the County should carefully balance between capacity charges and base charges, ensuring that there is not excessive reliance on capacity charges as the latter are more speculative and variable. This would reduce coverage risk but at the same time reduce the "growth pay for growth" goal achievement regarding distribution of financial burden between existing and future customers for any of the strategies in any year.

  Panelists suggested that the County should consider calculating capacity charges by identifying capital required for specific projects rather than using the "residual" method of determining revenue required of capacity charges based on identifying a difference between prospective rates and charges with and without a growth component. This would provide more direct reflection of implementing the "growth pay for growth" goal.

  Panelists acknowledged that systems should track capacity charge revenue and that capacity charge revenue should not be lost upon transfer of ownership of properties.

- **Capacity Charges and Legislative Change.** The Panel found that the planning process should move forward, as a conservative financial planning measure, without relying on early adoption of legislative changes regarding capacity charges.

  In the event that the state government does not enact a change to the capacity charge statute, capacity charges would be reduced to the amounts allowed under the current enabling legislation. The effects on rates if capacity charges were eliminated totally are indicated for each of the service strategies in the above table.

- **Capacity Charges and I/I.** Panelists had heard testimony that I/I associated with existing facilities and existing customers will increase in the future, thus decreasing the amount of excess or surplus capacity in sewer and treatment systems that could be used to support future growth. The Panel expressed concern that the total of existing excess capacity should not be used to determine the capacity charge amounts to be allocated to future customers without taking into account the ongoing capacity reduction from increasing I/I that is not attributable to future customers.

Question 6. Regulation Assumptions and Uncertainty

Are assumptions about the regulatory environment reasonable? How well do the strategies respond to uncertainties in the regulatory environment?

DISCUSSION

The discussion focused on a series of questions relating to water quality standards since these standards are assumed to be the primary drivers from a regulatory standpoint. The water quality standards are class-based standards. All existing and potential discharge points are currently classified Class A. There are numeric standards set for some conventional parameters (e.g., pH, temperature, fecal coliforms) and numeric criteria for others such as metals and toxic substances. Current and future discharges can meet the current standards with the help of a mixing zone.

Portions of Elliot Bay and the lower Duwamish River have been identified by Washington State Department of Ecology (WDOE) as having impaired sediment quality due to high concentrations of certain organic compounds and metals. Development of TMDLs is planned. Fecal coliforms are the only water column parameter failing to meet water quality criteria in Elliot Bay, and WDOE has recommended developing a TMDL for this parameter.

ISSUES

- **CSOs.** Although state regulations allow one untreated discharge per year and federal regulations allow 4 to 6 untreated events per year, these allowances do not apply in cases of endangered species habitats or bathing beaches. In these cases, federal regulations suggest such CSOs be eliminated. Thus, the County should not plan on being able to experience even one untreated CSO event per year per location. In addition, WDOE has indicated that enforcement efforts will increase in this area, and there is Clean Water Act citizen suit exposure in the event of violations.

- **TMDLs.** The total loading capacity of the Puget Sound receiving water body is not known. This is a source of regulatory uncertainty and therefore, risk. If a relevant area of Puget Sound does not attain water quality standards for a pollutant parameter, then WDOE will list it as a water quality limited water body and a TMDL must be prepared at some point in the future. A TMDL can result in additional discharge limitations or more stringent requirements, even if a permittee is otherwise in compliance with a National Pollutant Discharge Elimination System (NPDES) permit.

- **ESA Listings**. Another risk factor is the possibility that water quality standards and discharge limitations could become more stringent through ESA consultation and the need to protect habitat of listed species.

FINDINGS

- The assumptions about the regulatory environment appear to be reasonable for this level of long-range conceptual planning, except as noted below.

- CSOs may be subject to more stringent regulation in the future, particularly in consideration of the ESA listing of Puget Sound Chinook and the potential for development of TMDLs in the receiving water. CSOs discharging to bathing beaches may be subject to more stringent regulation than one untreated event per year.

- Land-use regulatory issues appear to affect future expansion at the West Treatment Plant more than water quality considerations. Service Strategy 1 relies on the ability to permit expansion of the West Plant and the East Plant in a timely manner. Service Strategies 3 and 3B rely on the ability to site and construct a third treatment plant. Siting and construction of a third treatment plant would allow added flexibility in responding to uncertainties in the regulatory environment.

- No guidelines exist by which to determine whether coastal marine ecosystems are eutrophic. Local research efforts should continue to determine whether Puget Sound and its tributary waterways are adversely impacted by excessive nutrients. Sources of nutrients need to be determined if cost-effective control efforts are required.

  It would be wise to develop and use a water quality model for the Sound and its tributaries in making major decisions regarding the diversion of wastewater from selected locations. Monitoring data can also be used to show long-term trends and provide more quantitative information for decision-makers. Continued monitoring can provide feedback on the success of various strategies and long-term trends that may be unrelated or independent of wastewater management activities or treatment strategies.

Question 7a. SS Flexibility and Adaptability to ESA

Are the strategies flexible and adaptable to endangered species listings such as Chinook salmon?

DISCUSSION

King County has committed to prepare a Habitat Conservation Plan (HCP) to deal with endangered species listings. The HCP will provide for an incidental take permit (permitting some loss of listed species or their habitat) to allow operations of the wastewater program. This feature is common to all service strategies.

FINDINGS

- An HCP will be prepared as part of any service strategy selected.

- The service strategies have different degrees of flexibility depending on how the response to endangered species listings develops. For example, if pollutant loadings must be reduced or a higher level of treatment is necessary for water reuse or nutrient removal, there needs to be space to expand the existing plants. Service Strategy 3 provides more flexibility in this regard.

Question 7b. SS Flexibility and Adaptability to Water Reuse

Are the strategies flexible and adaptable to the need for additional water supply?

DISCUSSION

King County has allocated a "placeholder" budget without defining the elements of a reuse program. The Panel noted the importance of working with local water purveyors to ensure that coordinated marketing, product availability, and financial aspects are mutually recognized and optimally pursued.

FINDINGS

- Service Strategy 3 has more opportunity for water reclamation and reuse.
- Service Strategy 1 can increase its water reuse component by incorporating water supply agency contracts to take secondary treatment effluent.
- Reuse planning needs to be closely integrated with conveyance and treatment. The location and size of a reuse facility will impact the assumptions used in the planning of treatment and conveyance facilities.
- Reuse is more likely to be trading reclaimed water for potable water rights than to be direct discharge of reclaimed water to streams.
- Pilot studies may be required to determine what impact introduction of reclaimed water to streams has on migrating salmonids.
- An effective marketing and public information program is critical to a successful reuse program.
- Impact of ESA listing of Chinook salmon on a reuse program is not known.

Question 7c. SS Flexibility and Adaptability to In-Stream Flows

Are the strategies flexible and adaptable to the need for in-stream flows and water for fish?

DISCUSSION

King County has committed to prepare a HCP to deal with endangered species listings. The HCP will provide for an incidental take permit to allow operations of the wastewater program. This feature is common to all service strategies.

ISSUES

- **I/I.** The effect of removing I/I flows should be evaluated in terms of potentially intercepted groundwater that may be left to enter small streams and drainages. This is a site-specific evaluation which may be influenced by the quality of the I/I and the species in the stream.

FINDINGS

- Service Strategy 3 provides more opportunity to augment instream flows for fish through its program of water reuse and reclamation compared to other service strategies.

Question 7d. SS Flexibility and Adaptabilty to Development Patterns

Are the strategies flexible and adaptable to different development patterns?

DISCUSSION

The Peer Review Panel discussed the flexibility of Service Strategies 1 and 3, focusing on how the strategies considered the impacts of both lower and higher than projected growth. It was noted that a key objective of the RWSP, or any other long-term plan, is to provide flexibility to accept changing conditions.

ISSUES

- **New Outfall and Tunnel.** For Service Strategy 3, it is likely that a new tunnel and Puget Sound outfall will also encounter serious opposition.

FINDINGS

- Panelists interpret "flexible and adaptable" to mean to err on the high side with respect to population growth, density, and development patterns. This suggests that Service Strategy 3 is more flexible and adaptable than Service Strategy 1.

- Panelists agreed that Service Strategy 1 appears to present the most risk if actual population growth meets or exceeds the forecasts or if future regulations require additional treatment. Service Strategy 3 appears to be less risky in this regard provided the new treatment plant can be successfully implemented.

- Service Strategy 3 offers increased flexibility in the very long term because it provides a third treatment plant site to accept flows and to help absorb future contingencies.

Question 8. SS Effectiveness Regarding Conveyance Inadequacies

How well does each alternative address the existing conveyance capacity problems (such as the Eastside and Kenmore interceptors)? Does each alternative have sufficient conveyance to support planned additional system capacity?

DISCUSSION

The key driver for the first major improvement is the need to avoid overflows from the Kenmore Lake Line.

FINDINGS

- The key area of concern, which is common to all strategies, is the need to confirm the peak wet weather flow rates to be conveyed. This confirming information is the intent of the proposed $31 million I/I study. The Panel concurs on the importance of this information and fully recommends that this study proceed without delay.

- Each service strategy appears to have sufficient conveyance to support planned additional system capacity.

- Each of the service strategies appears to have adequate capacity to support planned additional growth. However, Strategy 3 appears to have greater flexibility to meet unplanned additional growth. Unplanned growth can take the form of total growth being higher than expected or growth in selected areas being higher/lower than expected. Strategy 3 has greater flexibility to meet either form of unplanned growth.

Question 9. Regulation Change Regarding Secondary Treatment

Scientists differ on whether the benefits of secondary treatment are equal to or exceed its costs. Is it reasonable to expect that this requirement will be changed?

DISCUSSION

The EPA and WDOE have both written letters to King County stating that secondary treatment would be required, and that neither agency has the latitude under current law to consider a waiver of the requirement for secondary treatment. The letter from WDOE, in particular, states the need to provide "All Known Available and Reasonable Technology" (AKART). Secondary treatment is the technology standard for Washington state. Further, there is no provision in state law to pursue a waiver and recently proposed legislative amendments to consider this were not moved out of committee.

ISSUES

- **Reasons to Pursue a Waiver.** There is uncertainty associated with the ability of Puget Sound to absorb additional nutrients without degradation. It was acknowledged during discussions that there are cross media tradeoffs in going to secondary treatment. More energy is required for secondary treatment compared to primary and there are more biosolids generated.

- **Environmental Improvements from Secondary Treatment.** Since the West Plant has gone to secondary treatment, sediment monitoring data has not shown improvements over previous conditions. This is thought to be due to the physical nature of the discharge site (coarse-grained materials and high current velocities that do not promote accumulation of fines in the sediments). Loadings, however, have decreased.

FINDINGS

- **Scientific Disagreement.** The Panel concurred that scientists disagree on whether the benefits of secondary treatment are equal to, or exceed its costs.

- **Measurable Improvements.** Effluent water quality at the West Plant has improved since initiation of secondary treatment. Sediment monitoring data at the West Plant does not show marked changes, but this may be due to physical characteristics of the site that do not promote settling of fine materials.

- **Change in Secondary Treatment Requirements.** The Panel agreed that it was not reasonable to expect that the requirement for secondary treatment will be changed. There is no evidence that either the federal or state government is considering a change to the secondary treatment requirement.

Question 10. Certainty to Provide Capacity with Flexibility

How well does each strategy provide certainty for achieving needed capacity in a timely fashion and reduce risk for obtaining such capacity, while still retaining flexibility for implementation?

DISCUSSION

The question really should be re-worded "how does each strategy provide for uncertainty?" "Certainty" and "timely" are difficult parameters to deal with on a plan with so many variables. The focus should be to provide capacity when it is needed to avoid exposing people to public health risks.

FINDINGS

- The treatment strategies may have not fully considered the potential impacts of future regulatory requirements for nitrogen removal. If nitrogen removal is required as an effluent limitation, the assumptions about reclamation at both the West and East Plants would be limited by available space. Nitrogen removal could be driven by state TMDL development, particularly at the East Plant, as well as ESA issues.

- Of all components of the RWSP, the potential to significantly expand the West Treatment Plant seems most likely to encounter problems. Expansion of the East Treatment Plant is also expected to face local opposition. Considering these issues, a third treatment plant would offer flexibility and adaptability to the overall RWSP program. The net present value of this flexibility is $300 million.

- Nitrogen removal at the West Plant would preclude incorporation of a reuse program due to space limitations. A similar situation would occur at the East Plant, where reuse would be limited.

- The existing East Plant outfall into the Puget Sound is a less than optimal discharge location due to flushing and mixing.

- The land required for the North Plant may be understated. The assumed 30- to 60-acre footprint would have inadequate buffer and may limit flexibility for expansion. Acquiring a larger parcel would be more prudent. However, a larger parcel may not be available at a reasonable cost, which would impact the North Plant siting.

- The evaluation of treatment and conveyance cannot be separated. Modification to the treatment strategy directly impacts the conveyance system and vice versa.

- The potential for partnering between wastewater utilities in Snohomish County and King County appears feasible. This approach may provide some advantages for optimizing conveyance and treatment.

- The Panelists believe the risk of added cost or delays due to future changes in regulations or policies is greater with Service Strategy 1 than Service Strategy 3.

- Progressive siting of a North Plant will be required. This includes a proactive public information process. The Panelists agreed that timely approval and permitting of plant siting or expansion is a risk for each of the North, East, and West Plants.

- Panelists observed that both Service Strategy 1 and Service Strategy 3 have flexibility in the near term, but Service Strategy 3 is more flexible in the long term. It appears that neither Strategy 1 or 3B provide as much certainty or flexibility necessary to protect both people and fish in a timely fashion. The flexibility and adaptability of Service Strategy 3 comes at a net present value of approximately $300 million dollars more than other service strategies. Over the long term, the difference in monthly sewer service charges is not significant between the service strategies. The capacity charge is greater for Service Strategy 3 compared to Service Strategy 1. The Panel acknowledges the value of comparing this $300 million difference to other County investment needs. Service Strategy 3 reduces near term opportunity dollars.

- The Panelists believe Service Strategy 3 has less resistive forces than Service Strategy 1 based on information presented to the Peer Panelists. However, the Panelists also agreed that this is a judgement best made by King County staff and elected officials who are more experienced with the competing views of the stakeholders.

- Some Panelists note that expansion of the West Plant associated with Service Strategy 1 may be a “non-starter”. Environmental opposition to the expansion will point out that the County has another feasible alternative (Service Strategy 3), that has been recommended by the County Executive. Furthermore, if Service Strategy 1 is selected there will be financial penalties (sunk cost of unnecessary interceptors) if the West Plant cannot be expanded.

Question 11. Other Topics Not Reasonably Evaluated for SS

Are there other significant topics that were not reasonably evaluated for all five strategies?

DISCUSSION

Three areas were identified for this question: environmental justice, alternative technologies, and the relation between water conservation and wastewater flow reduction. Environmental justice includes both socio-economic as well as natural resource based issues. Alternative technologies includes research and development of approaches to wastewater control that depart from the traditional "concrete and pipes approach", such as more pervious paved areas, wetlands biofiltration, and inline treatment. The water conservation/flow reduction issue relates to demand management. Panelists noted that water conservation can reduce wastewater revenues.

FINDINGS

- For this level of planning, environmental justice, alternative technologies, and water conservation appear to have been reasonably evaluated.

- It might be prudent to document environmental analyses related to environmental justice, which are not specifically mentioned in the Environmental Impact Statement (EIS).

- Panelists are concerned that environmental justice may make expansion of the East Plant a less attractive fallback in response to unforeseen events. Panelists acknowledge that south King County is aware of regional inequity regarding siting of infrastructure facilities.

- Panelists note the need to fully evaluate non-construction alternatives during plan implementation.